

REMARKS

The abstract has been amended to cure grammatical and idiomatic errors contained therein. No new matter has been added.

In order to expedite the prosecution of the present application and respond to the formal rejections made by the Examiner, Claims 4-8 have been amended to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention, or to cure grammatical and idiomatic errors contained therein. Claims 4-7 are amended so as to depend upon the new independent Claim 9. Claim 8 is supported by paragraph [0001]. New Claims 9-14 have been submitted. Independent Claim 9 is based on original Claim 1, as well as the embodiment shown in Figure 1 and the relevant description in paragraphs [0028], [0029], [0034] and [0035]. New Claim 14 is disclosed in original Claim 2. Claims 10-13 are supported in Figures 1-3, 8, and paragraphs [0009]-[0011], [0028], [0032], [0041] and [0048]. Claims 1-3 have been cancelled, because the subject matters of Claims 1-3 have been incorporated into new Claims 9-14. It is respectfully submitted that the currently presented claims contain no new matter and are cured of all formal defects. No new matter has been added.

Claims 1-8 have been rejected under 35 U.S.C. §102(a) as being anticipated by Sudo et al., Patent No. 7,146,195 B2. Applicants respectfully traverse this ground of rejection and urge that the presently claimed invention is patentably distinguishable over the prior art cited by the Examiner.

New independent Claim 9 is directed to a biaxial hinge of a biaxial structure having a rotating shaft and an opening/closing shaft, in which a rotating shaft member is fixed to a rotating shaft support member and the biaxial hinge has a sliding member disposed so as to rotate synchronously with the rotating shaft member, a rotation-side member which rotates around a center of the rotating shaft member, two

grooves which are formed on one side of the sliding member facing the rotation-side member, two guide members are fixed to the rotation-side member to accommodate two pressing members, respectively, therein and guide movements of the respective two pressing members to allow smooth up and down operation and two elastic bodies which independently press the respective two pressing members. An opening/closing torque unit mechanism having an opening/closing shaft for opening and closing operations to be perpendicular to the rotating shaft member is disposed at either the left or the right of said rotation-side member.

Sudo discloses a hinge device connecting a body member and a cover member, which comprises: a horizontally extending open-close hinge unit to open and close the cover member and to hold the open cover member at a first open position where a cell phone operation can be performed; and a vertically extending pivotal hinge unit secured to the body member, and when the cover member is opened beyond the first open position, activated to allow the cover member to pivot clockwise or counterclockwise, the pivotal hinge unit being adapted to hold the cover member at a pivotal position 90 degrees or 180 degrees clockwise or counterclockwise from the body member. As described in column 10, line 63 to column 11, line 49, when the cover member is opened, it is stopped at the first open position (an opening angle of about 160 degrees) and when it is further opened, is stopped at the second open position (an opening angle of about 180 degrees). When the cover member reaches the second open position, the hinge mechanism of the hinge device switches its operation from the open-close hinge units to the pivotal hinge unit. If an operator pivots the cover member from a pivotal reference position, the four balls in the second spacer move out of the recesses of the second disk and roll along the guide path. In other words, the pivotal movement of the cover member is prevented until the cover member is opened beyond the first open position and reaches the second open position. In the

pivotal movement, the cover member reaches a first pivotal position 90 degrees from the pivotal reference position and the four balls fall into the recesses with a click and are held there by the biasing force of the coil spring. When the cover member arrives at a second pivotal position 180 degree from the pivotal reference position by further pivotal movement of the pivotal hinge unit, the balls fall into the other recesses with a click. At this second pivotal position, the cover member is held by the biasing force of the coil spring and further pivotal movement is prevented.

The Examiner compares the respective members of Sudo with those of Applicants' invention. The Examiner compares some members provided for open/close operation in Sudo's device with the members provided for the rotational operation of Applicants' rotating shaft member. For example, the Examiner considers that Applicants' pressing members and elastic bodies correspond to the balls and the coil spring, but not the balls and the coil spring of Sudo's device. The members for pivotal movement in Sudo have to be compared with the members provided for rotational operation of Applicants' biaxial hinge mechanism.

In comparison of the claimed biaxial hinge with Sudo's device, the biaxial hinge of the present invention is patentably distinguished in the click generating mechanisms from each other. In order to generate clicks, the biaxial hinge claimed in new Claim 9 requires two pressing members provided in the rotating-side member to abut the grooves of the sliding member and the two elastic bodies which independently press the respective two pressing members. The grooves are provided on the lower surface of the sliding member and extend in the radial direction. One elastic body presses one pressing member against the groove. Two of this pair of elastic body and pressing member are provided in the rotation-side member as shown in Figures 1 and 2.

Contrary to the present invention, the biaxial hinge of Sudo has a plurality of balls rolling in a circular guide path

and recesses in which the balls fit, and a single elastic body around the axis presses all the balls to let the balls fit in the recesses and thereby to generate clicks. The guide path is a shallow concentric circular groove with respect to the axis of the pivotal hinge unit and does not correspond to Applicants' grooves formed in the sliding member in the radial direction with respect to the axis of the rotating shaft member.

Accordingly, Sudo fails to disclose the two pressing members and the two elastic bodies to press the individual pressing members defined in Claim 9. Because of this structural difference and other structural differences described below, there are technical merits of Applicants' biaxial hinge not shown in Sudo's device.

First, a technical merit of the present invention is that rotating operation and the opening/closing operation can be carried out independent of each other. This merit is achieved because the opening/closing torque unit mechanism can be disposed at the side of the rotation-side member without functional/operational restriction by the rotating shaft member. Even when the opening angle is a very arbitrary degree, the rotating motion is possible at that opening angle. Further, the rotating operation and the opening/closing operation can be made at the same time. When the biaxial hinge is applied to an electronic device, users can select a talking position arbitrarily. Further, since the pressing members are accommodated within the guide member and guided, movements up and down are smoothly made and appropriately controlled. Therefore, the durability of the pressing members is ensured.

On the other hand, for the biaxial hinge of Sudo, the rotating operation motion (pivotal movement) is possible only when the cover member reaches the second open position (opening angle of 180 degrees) as mentioned above. When the hinge of Sudo is applied to a mobile phone, the talking position is restricted to 160 degrees. In the opening angle

range from the closed state to the second open position, the pivotal movement of the cover is prevented because the large-diameter portions of the cam member engage the locking member at a pushed-down position.

Therefore, the biaxial hinge of the present invention is much more useful and convenient than that of Sudo because of the flexibility of rotational motion which is independent of the opening angle.

Another technical merit of the present invention is that the motion in the rotational direction, which means rotation around the rotating shaft member, is quite stable. This is achieved by the two pairs of elastic body and pressing member which are provided to generate clicks wherein each pressing member is pushed by each elastic body. Thereby, the pressures of pressing members against the rotation-side member are constantly even, the engagement between the pressing member and the groove is kept stable during rotation and shakiness between them is effectively prevented.

Contrary to the present invention, Sudo teaches that a plurality of balls on the guide path are pressed only by one elastic body to generate clicks. Since the elastic body is only by a single one, the hinge is not stable in the rotational direction then it can shake or stumble during the rotating motion.

As mentioned above, the biaxial hinge mechanism of the present invention and that of Sudo were designed for entirely different requirements with respect to closing/opening operations and rotating operations and they are entirely different in their structure and operational mechanism. All the other claims depend from Claim 9, the biaxial hinge of the present invention as defined in Claim 9 is patentably distinguishable and unobvious over Sudo. All the other claims depend from Claim 9, these claims should also be patentable for at least the same reason as Claim 9.

As one embodiment of this invention, the biaxial hinge of the present invention may be provided with a rotation stopper

mechanism to restrict a rotational range between the rotating shaft member and the rotation-side member. However, the rotation stopper mechanism is different from the restriction or locking mechanism of Sudo and have merits over Sudo described below.

The stopper mechanism of the restriction of rotation is shown in Figure 6 and paragraph [0046]; and the stopper mechanism for restriction of the opening and closing angle is shown in Figure 9 and paragraph [0049]. As described in paragraph [0050], the biaxial hinge of the present invention can be equipped on a portable telephone as shown in Figure 11. When the biaxial hinge of the present invention including the stopper mechanism as shown in Figures 6 and 9 is used, for example, in the portable telephone shown in Figure 11, the monitor is prepared for a clockwise rotation of 180 degrees and an open of 180 degrees from the closed state.

1) If the monitor is in the closed state, the stopper mechanism allows the cover having the monitor to rotate clockwise by 180 degrees while keeping the monitor in the closed state. However, counterclockwise rotation is prevented by the stopper mechanism.

2) If the monitor is fully opened from its closed state by opening of 180 degrees by the closing/opening hinge, the monitor can be further rotated by 180 degrees in the clockwise direction. However, counterclockwise rotation is prevented by the stopper mechanism.

3) In the case where the monitor is in the position between the closed position and the opening position, clockwise rotation of 180 degrees is possible, as in the case of 1) and 2).

Further, three-dimensional motion becomes possible by combination of closing/opening operation of the closing/opening torque unit mechanism and the above clockwise rotation. Further, the monitor can be turned inside out as shown in Figure 11(d), even at a small opening angle of 90 degrees.

As mentioned above, in the case of incorporating the stopper mechanism in the claimed biaxial hinge, rotation and closing/opening are not prevented within the range allowed by the stopper mechanism. Also, in the case shown in Figures 11(b) and (c) in which the monitor shows the face side, the rotation can be a counterclockwise rotation. Also, the rotational range and direction required by the biaxial hinge can be altered by varying the number, position, and shape of the stopper mechanism.

Contrary to this, the device of Sudo prevents the pivotal movement (rotation) during the opening movement of the cover member by the rotation-locking mechanism. Further, the rotation of the display is allowed only in the horizontal direction and three-dimensional movement is not allowed by the locking mechanism. Accordingly, Claim 9 is believed to be patentably distinguishable over Sudo.

Claims 4-8 and 10-14 depend upon what is believed to be an allowable Claim 9, are believed allowable therewith, and include additional features which further distinguish over Sudo. For example, Claim 4 discloses "one of a coil spring, a coned disk spring, a corrugated leaf spring, and a thin leaf spring is employed as the elastic body." Although Sudo discloses a coil spring, Sudo does not disclose a coned disk spring, a corrugated leaf spring, and a thin leaf spring. Sudo does not also disclose that one of them is employed as the elastic body.

Claim 5 recites that a through-hole is provided in a center of the rotating shaft member. Sudo does not disclose the rotating shaft member, and a through-hole in Sudo's invention is not provided in a rotating shaft member.


Claim 6 discloses a rotation stopper mechanism to restrict a rotational range. Claim 7 discloses the opening/closing torque unit mechanism and a click generating mechanism. Sudo does not disclose the rotation stopper mechanism, the opening/closing torque, and the click generator.

Claim 8 recites "an electronic device equipped with the biaxial hinge." Sudo does not teach an electronic device, specifically equipped with the biaxial hinge disclosed in Claim 9.

New dependent Claim 10 further discloses that two holes are provided in the rotation-side member and the elastic bodies are embedded in the holes. Claim 11 recites that the pressing members have a protruding section on a surface that contacts the elastic body. Claim 12 discloses the pressing members that are spherical at their surfaces facing the grooves, and the pressing member of Claim 13 is cylindrical. Claim 14 recites that the rotating shaft support member and the sliding member are closely fixed to the rotating shaft member. Sudo does not teach these newly claimed subject matters.

For the above reasons allowance of Claims is respectfully requested. Further and favorable reconsideration is respectfully requested.

Respectfully submitted,


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